

ANTIBACTERIAL EFFICACY OF COTTON AND SILK FABRIC FINISHED WITH PLANTS EXTRACTS

NEETA SINGH¹, PARVEEN PUNIA² & VIVEK SINGH³

¹Research Scholar, Department of Textile and Apparel Designing, I.C College of Home Science
CCS Haryana Agriculture University, Hisar, Haryana, India

²Professor Department of Textile and Apparel Designing, I.C College of Home Science
CCS Haryana Agriculture University, Hisar, Haryana, India

³Associate Professor Department of Textile and Apparel Designing, I.C College of Home Science
CCS Haryana Agriculture University, Hisar, Haryana, India

ABSTRACT

Textile industry, continuously searches for new technologies in order to accomplish the consumers' demands. Recently new developments allowed the production of functional and smart textiles which are capable of sensing changes in environmental conditions or body functions and responding to these changes (Singh *et al.*, 2005). Likewise, consumers' attitude towards hygiene and active lifestyle has created a rapidly increasing market for a wide range of textile products finished with antimicrobial properties, which in turn has stimulated intensive research and development (Ramachandran *et al.*, 2004). Bacterial growth on the textiles can be inhibited by applying the antimicrobial finish. Antimicrobial finish can be applied with chemical and natural botanical antimicrobial agents

Most of the people discard the underutilized parts of plants and only a few reuse them. Underutilized parts of plants means the parts used less than fully or below the potential and not used as much as it could be. The discarded or left over portions of the plant like seed, peels and skins can be reused for both environment and economic benefits. These parts can also be used to create value added products.

Thus, it is prudent to use the peel of onion and pomegranates were selected for preparation of plant extracts for bacterial resistance on cotton and silk fabric.

KEYWORDS: Antibacterial Efficacy of Cotton and Silk Fabric Finished, Textile Industry, Environment and Economic

INTRODUCTION

Material and Methods

Plants material Extraction

The peel of onion and rind of pomegranate were selected for preparation of plant extracts for antibacterial finished on cotton and silk fabric and it were procured from local market of Hisar District, Haryana, India. These selected plants were collected, shadow dried and crushed for extraction. The water extract of the powders of selected plants were obtained by soaking of 10 gm of powder in 100 ml of distilled water in round bottom flask for overnight. The extraction was done by hot continuous soxhlet extraction method (Mukherjee, 2002). Resulting extract was evaporated and concentrated to dryness using the rotatory evaporator at 50⁰C and stored at -4 ⁰C till further used.

Application Method

Plain woven cotton and silk fabric was desized/ degummed and scoured prior to the application of the antibacterial finish. Aqueous extract were applied to cotton and silk by exhaustion methods at material to liquor ratio of 1:40, then its was dried at room temperature. The fabric was treated with plants extracts solution of 3 % and 5 % of pomegranate and onion respectively by two method i.e. exhaustion methods and pad dry cure methods. Finally the fabric samples were tested for antibacterial activity as per the ATTCC 100 Test Standard.

Quantitative Test (AATCC-100)

The antibacterial effectiveness of treated fabrics with plants extracts are carried out by standard test method AATCC-100. The cotton and silk fabric of 2x2 inch was treated in 3 % and 5 % of pomegranate and onion respectively. The fresh culture of *E.coli* was inoculated to sterilized broth followed by the transfer of treated fabric sample. These were incubated at 30⁰ C for 24 hrs in shakers at 120 rpm. The absorbency was checked at 600 nm with sterilized LB medium as blank (Thilagavathi and Kannaian, 2008)

RESULT AND DISCUSSIONS

• Antibacterial Finish on Textile

The yield of aqueous extract of pomegranate and onion was found to be 17.27 percent and 7.46 percent respectively. The result was showed in the table-1, that cotton fabric was finished with two methods i.e. exhaustion and pad dry cure methods of two different concentrations. The result was showed that, finishing through exhaustion method was more effective than pad dry cure method. Bacterial count i.e. CFU/ml of cotton fabric finished with aqueous extract of pomegranate (3%) by exhaustion methods and Pad dry cure methods respectively i.e. 2.9×10^7 and 6.7×10^7 and CFU/ml of cotton fabric finished with aqueous extract of onion by exhaustion methods and Pad dry cure methods respectively i.e. 2.5×10^7 and 1.3×10^8 . In Both the cases bacterial count of silk fabric finished with exhaustion method was more effective than pad dry cure method.

Table1: Antibacterial Efficacy of Cotton Finished with Plants Extracts

Application Method	Concentration of Extracts	Bacterial Count (CFU/ml)	
		Pomegranate Peel Extract	Onion Peel Extract
Exhaustion methods	3	2.9×10^7	2.5×10^7
	5	2.4×10^7	2.3×10^7
Pad dry cure methods	3	6.7×10^7	1.3×10^8
	5	2.3×10^7	1.6×10^7

Silk fabric was finished with two method i.e. exhaustion methods and pad dry cure methods of two different concentrations. The result was showed in the table-2 and observed that exhaust method was more effective as compared to the pad dry cure method. It was supported by the findings of Mahesh *et al.* (2011) they reported that for coating of herbal extract, the exhaust method was found to be effective and suitable than dip coating method. Bacterial count i.e. CFU/ml of silk fabric finished with aqueous extract of pomegranate (3%) by exhaustion and pad dry cure methods i.e. 2.4×10^4 and 5.6×10^2 respectively and CFU/ml of silk fabric finished with aqueous extract of onion (3%) with exhaustion methods and pad dry cure methods i.e. 2.5×10^4 and 4.0×10^2 respectively. Jothi (2009) also reported that percentage reduction was 99.10% with 5g/l concentration whereas, 97.90% and 98.10% with 2 g/l and 3g/l respectively for *S.aureus*. In Both the

cases bacterial count of silk fabric finished with exhaustion method was more effective than pad dry cure method. As the concentration of extracts of pomegranate and onion were increased, the bacterial count was also decreased.

Table2: Antibacterial Efficacy of Silk Finished with Plants Extracts

Application Method	Concentration Of Extracts	Bacterial Count (CFU/MI)	
		Pomegranate Peel Extract	Onion Peel Extract
Exhaustion methods	3	2.4×10^4	2.5×10^4
	5	2.3×10^4	2.0×10^3
Pad dry cure methods	3	5.6×10^2	4.0×10^2
	5	5.5×10^2	2.7×10^3

CONCLUSIONS

The finishing of cotton and silk fabric using plants natural products was found to exhibit antibacterial properties. The fruits rind of pomegranate and peel of onion as, an efficient antimicrobial agent for the preparation of antimicrobial finish of fabric. The antibacterial efficacy of extracts finished on cotton and silk fabric with exhaust method was more effective as compared to the pad dry cure method.

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